# Mold: Basic Issues

by

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# What is a Bioaerosol?

- Any aerosol of biological origin.
  - Parts
  - By-products
  - Organisms
- Frequently encountered bioaerosols.
  - Molds, bacteria, protozoa, viruses
  - Feathers, insects, feces
  - Endotoxins, mycotoxins, MVOC's

# Health Effects of Molds

- Allergic Reactions
  - Hay fever, allergic rhinitis, hypersensitivity pneumonitis, asthma
- Infections
  - Colds, TB, Flu, legionella, etc.
- Irritation and Toxic Reactions
  - Mycotoxins, endotoxins, MVOC's
  - Stachybotris

# Allergic Rhinitis

- Prevalence rate of 10% - 20% of population.
- Sympt. - Runny and congested nose, inflamed throat and eyes, sneezing, etc.
- Caused by IgE mediated inflammation and histamine release.

# Hypersensitivity Pneumonitis

- Caused by repeated or continuous exposure to antigenic substances.
- Flu symptoms - chills, fever, malaise, cough, difficulty breathing.
- Granulomatous lesions within the lung.
- Easily misdiagnosed.
    - Sarcoidosis

# Stachybotrys chartarum

- Toxigenic fungi implicated in pulmonary hemosiderosis.
  - Produces trichothecene mycotoxins
- Cluster of 10 cases of PH in Cleveland.
  - Associated with major water damage,increased fungal levels.
  - Major concern was S. chartarum.
  - Published in MMWR and journals.

# Stachybotrys (cont)

- Special Panel Review
  - Sample results were not correct.
  - Sampling was not blind.
  - Water damage in control and test homes gave equal S. chartarum presence.
  - PH not found in other flood areas with S. chartarum.
- Not sufficient evidence to support an association.

# Causes of Mold Problems

- Reservoir
  - Moisture, food, warmth
  - Selection factors
- Method of dissemination
  - Ventilation system
  - Air currents
- Susceptible individuals

# Moisture and Mold Problems

- Moisture, Moisture, Moisture.
- Moisture Infiltration.
  - Groundwater
  - Sprinkler Systems
  - Roof Leaks
- Internal Moisture.
  - Humidity
  - Evaporative Coolers
  - Condensate Pans


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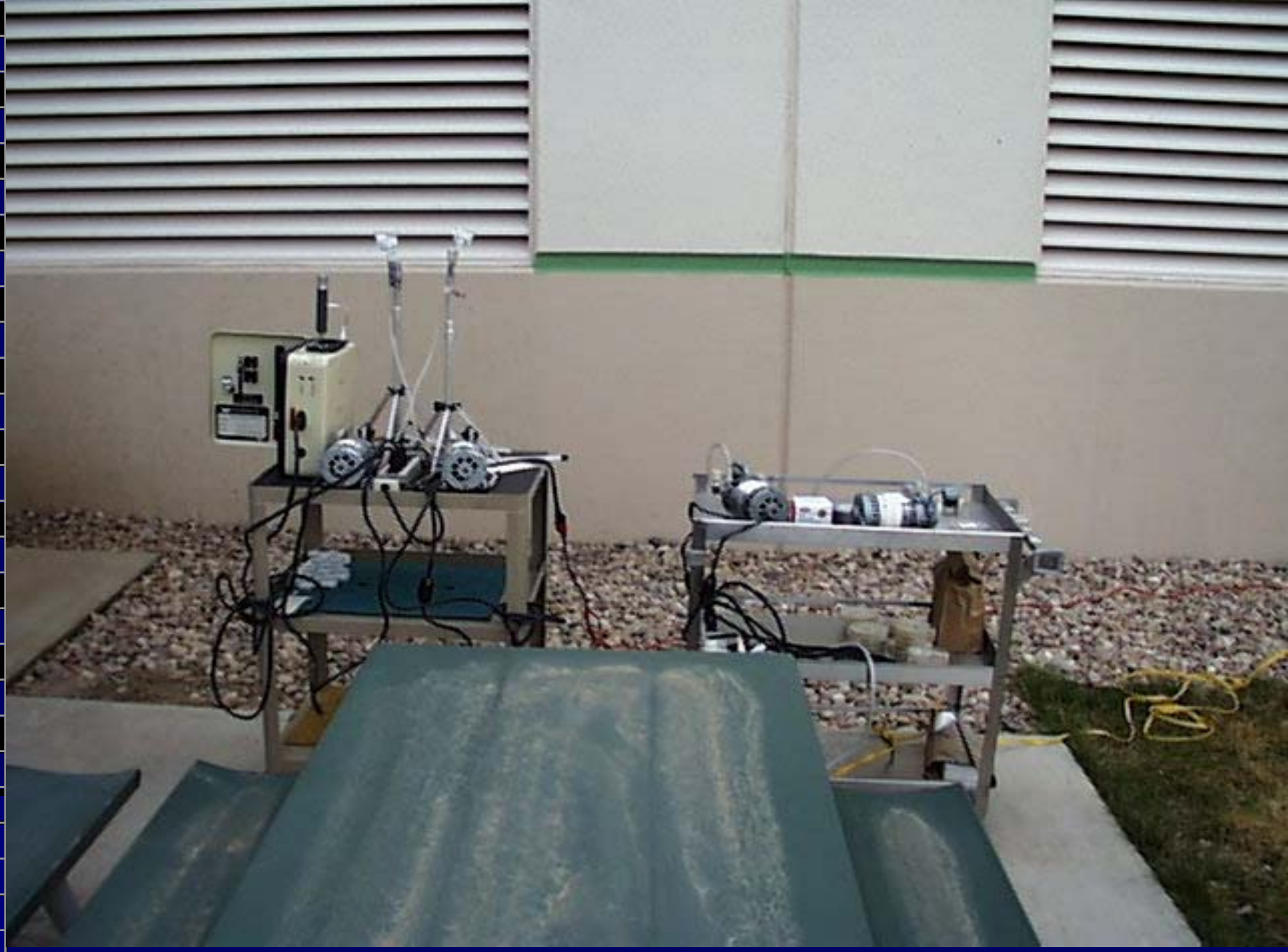
# Mold Sampling Methods

- Non-viable Samples
  - Tape samples
  - Bulk Samples
  - Slit Impactors
- Viable Samples
  - Bulk Samples
  - Cascade Impactors
- Polymerase Chain Reaction


GAST



# Is Sampling Necessary?

- Is visible mold present?
- Has there been water intrusion into the building?
- Has hypersensitivity pneumonitis been diagnosed in the building?
- What are the specific aims for a sampling program?
- How much money do you have?

# Why not to conduct bioaerosol sampling.

- To determine the presence or absence of a bioaerosol.
- To determine if an area is safe.
- To determine the cause of frequent colds, flu, rashes, etc..
- To show that mold from the carpet, etc. is entering the air.

# What do the Results Mean????

- Factors to look at:
  - Numbers present
  - Species present
  - Comparison to control areas
  - Comparison to outside levels
- Are there any standards?

# Case #1
# Air Sampling Results

| Location | Total Fungi | Penicil. Sp. | Clado. Sp. |
|---|---|---|---|
| **Outside** | 495 | 18 | 272 |
| **B-147** | 36 | 12 | 18 |
| **A-102** | 77 | 41 | 12 |
| **B-122** | 89 | 24 | 30 |
| **C-113** | 2915 | 2037 | 7 |
| **D-107** | 259 | 41 | 42 |

# Case #2
# Airborne Sampling Results

| Location | Tot. Fungi | Penicil. Sp. | Aspergil. Sp. |
|---|---|---|---|
| **Outside** | 813 | 80 | 0 |
| **Old Barn** | 1095 | 100 | 500 |
| **Slaughter House** | 85,760 | 85,760 | 0 |

# Case #3
# Airborne Sampling Results

| Location | Tot. Fungi | Aspergil. Sp. | Cladosp. Sp. |
|---|---|---|---|
| **Outside** | 251 | 3 | 150 |
| **A127** | 356 | 238 | 53 |
| **A113** | 131 | 78 | 36 |
| **A117** | 148 | 0 | 106 |
| **A106** | 18 | 12 | 6 |

# Blank Results

- 148 *Aspergillus sp.*
- 36 *Penicillium sp.*

# Is Remediation Necessary?

- Is there a potential for exposure?
- What is the potential for health effects?
- What risks will remediation present?
  - Employees and residents.
  - Remediation workers.
- Is Remediation likely to be successful?
- Cost - Benefit of remediation.

# When Should Remediation be Conducted?

- **Only** after the initial cause has been corrected!!!!
- If visible biological contamination has been found.
- If chronic moisture control problems have occurred.
- If the facility has been found to be producing a bioaerosol.

# Goals of remediation

- To remove bioaerosol sources within the building.
- To protect occupants during remediation process.
- To protect remediation workers.
- To prevent the spread of biological material to previously uncontaminated areas.

# Health Concerns During Remediation

- Dust exposure for sensitive individuals.
- Allergic response from sensitized individuals.
  - Asthma
  - Atopic
  - Hypersensitivity Pneumonitis
- Organic Dust Toxic Syndrome (ODTS)
  - Fever, flu-like symptoms, respiratory affects.

# Guidelines for Remediation

- New York City, Dept. of Health Guidelines.
- ACGIH Bioaerosols: Assessment and Control
- EPA Mold Remediation in Schools and Commercial Buildings

# Items to be Considered

- Hard easily cleanable surfaces
- Semi-porous surfaces
- Porous surfaces
- Structural surfaces
- Furniture, papers, etc.
- Cooling towers, humidification systems, and HVAC systems.

# Easily Cleanable Surfaces

- Examples - metals, glass, plastic, etc.
- Mitigation
  - Not frequently involved.
  - Can be cleaned with a detergent or disinfectant/detergent.

# Semi-Porous Surfaces

- Examples - Wood studs, paneling, furniture, etc.
- Reusability depends upon:
  - Structural integrity
  - necessity
  - Ease of cleaning
- Clean by removing fungi and refinishing.

# Porous Surfaces

- Examples - carpeting, fabric, pads, dry wall, furniture.
- If contaminated with actual mold growth, removal may be necessary.
- Even if mold growth did not occur, spores and odors may be present.
    - Washing and HEPA vacuuming may help remove contamination.

# Porous Surfaces (Cont)

- Dry Wall
  - Remove water damaged material.
  - Remove mold-contaminated material.
- Furniture
  - Water damaged - remove
  - Non-damaged - Clean and disinfect if possible.
- Papers and Books
  - Discard water damaged items.
  - Freeze drying or cleaning may be possible.

# HVAC Systems

- Air Handler Decontamination
- Duct Decontamination

# Air Handler Decontamination

- Primary problem areas:
  - Drip pan
  - Fiberglass lining
  - Filters
  - Heat exchangers
- **DO NOT** decontaminate while in use and occupied!!!!!!

# Drip Pans

- Must be designed to drain.
  - Anti-siphon
  - Anti-vacuum
  - Clean
- Clean drain pans when necessary.
- Can disinfect and clean when not in service.
- Do not use continuous disinfectant.

# Duct Systems

- Lined and Unlined Ducts
  - Condition of lining
  - Cleanliness of lining
  - System moisture
- Duct Cleaning (To Clean or Not to Clean)
  - Reheat systems may be clogged
  - Chemicals should not be used

# WHEN GERMS ATTACK!


**Dust, mold and microscopic germs maybe attacking you from the air ducts!**

Indoor air pollution is often worse than the air outside. Your home's air ducts contain dirt, dust mites, mold, dead animals and microscopic germs. These pollutants can make your family sick with colds and allergies! Dirty air ducts can affect your family's health and make your furnace run inefficiently. Call now and ask for a FREE estimate! Monster Vac can improve your Indoor Air Quality. Take advantage of our superior power and get Monster Vac'd today!

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# Filters

- Replacement schedule
  - Effect on filtration.
  - Effect on flow.
- Poor maintenance
  - Missing filters
  - Inappropriate size
  - Filter type

# New York Guidelines

- Guidelines are for both areas and the HVAC System.
  - Level 1: Small Isolated Areas
  - Level 2: Mid-Sized Isolated Areas
  - Level 3: Large Isolated Areas
  - Level 4: Extensive Contamination
  - Level 5: Remediation of HVAC Systems
    - Less than 10 sq.ft.
    - Greater than 10 sq.ft.

# ACGIH Recommendations

- Minimal Contamination
  - Source Containment
  - Dust Prevention
  - N95 and gloves
- Moderate Contamination
  - Local Containment
  - Eye and body protection
- Extensive Contamination
  - Full Containment

# EPA Mold Remediation in Schools and Commercial Buildings

- Areas Less than 10 sq.Ft.
  - N-95 Respirator, gloves and goggles
  - No Containment
- 10 sq. ft. to 100 sq.ft.
  - Limited or full protection
  - Limited containment
- > than 100 sq.ft.
  - Full personal protection
  - Full containment

# Remediation Effectiveness

- Primary criterion = can people reoccupy the space.
- Remediation samples:
  - Surface Samples
  - Air Samples
  - Absence of mold or water damaged material.
- If cause has not been remediated, the problem will be back.

# References


- Bioaerosols: Assessment and Control
  - American Conf. Of Govt. Industrial Hygienists
- Mold Remediation in Schools and Commercial Buildings
  - U.S. EPA
- Field Guide for the Determination of Biological Contaminants in Environmental Samples
  - AIHA
- Guidelines on Assessment and Remediation of Fungi in Indoor Environments
  - New York City Dept. of Health